RELATIVE IMPORTANCE OF TOMATO YELLOW LEAF CURL
VIRUS-1s AND -Sr SPECIES IN INFECTIONS OF TOMATO IN SPAIN

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Tomato yellow leaf curl virus (TYLCV) was first reported in Spain in 1992 as the causal agent of tomato yellow leaf curl (TYLC) epidemics in tomato (Lycopersicon esculentum Mill.) and it is widespread in south and southeastern regions. Isolates of the TYLCV-Sr species were associated with TYLC symptoms. Recently, isolates of the TYLCV-1s species were also found to be involved in TYLC epidemics and were associated with the more severe symptoms caused in tomato. The presence and relative importance of both TYLCV species in successive epidemics in tomato has been studied in south and southeastern Spain. Disease progress curves were obtained for 1996, 1997 and 1998 epidemics in open field tomato crops from Málaga (southern Spain) and for 1997 in protected tomato crops in Almería (southeastern Spain) based on random samplings made weekly in three commercial fields per year. In the same years, tomato surveys were also made in the main tomato-growing regions of south and southeastern Spain. Digoxigenin-labeled DNA probes that specifically recognise TYLCV-Sr or -1s were prepared and samples were analysed by hybridisation of prints of leaf petiole cross sections on nylon membranes. Results will be presented that show clearly a rapid increase of the relative importance of TYLCV-1s in TYLC epidemics in Spain. Two aspects that could be involved in the differential spread of both viruses in tomato crops have been studied: first, the differential ability of local biotypes of Bemisia tabaci Gen. (biotypes B and Q) to transmit TYLCV-Sr and -1s isolates from Spain; second, the occurrence and relative importance of TYLCV-Sr and -1s in alternative hosts. Transmission experiments were done from tomato to tomato using two adult females per test plant, with acquisition and inoculation access periods each of 24 h. Experiments were performed in a growth chamber at 25 °C day, 20°C night and 16 h photoperiod. Results showed differences in transmission: both TYLCV-Sr and -1s are efficiently transmitted by biotype Q, similarly to transmission of TYLCV-1s by biotype B; whereas TYLCV-Sr was transmitted at a significantly lower efficiency by biotype B. In addition, TYLCV-1s was found to be more prevalent in alternative hosts than TYLCV-Sr. The latter should be stressed especially for common bean (Phaseolus vulgaris L.), a species that is frequently used in crop rotations with tomato, in which high incidences of TYLCV-1s infections have been reported recently. The implication of these results in the epidemiology of TYLCV-Sr and -1s will be discussed.

MANAGEMENT OF GEMINIVIRUS EPIDEMICS OF FIELD-GROWN TOMATO IN FLORIDA AND THE DOMINICAN REPUBLIC

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Although known from Florida more than 100 years ago, Bemisia tabaci was not reported to infest tomato or many other vegetable crops such as cucurbits prior to 1986. The situation changed with the appearance, first on poinsettia, of the silverleaf whitefly, a new biotype later described as the species Bemisia argentifolii. Named for a squash disorder induced by nymphal feeding, high populations of silverleaf whitefly were soon seen on vegetables. In tomato, impact from feeding and sooty mould was quickly surpassed (in 1988) by appearance of a new disorder, irregular ripening, in
turn surpassed in impact a year later by a new geminivirus, tomato mottle (ToMoV). Losses and control costs during the 1990-1991 season were estimated at 141 million $US. A similar series of events occurred in the Dominican Republic except that indigenous geminivirus was supplanted by tomato yellow leafcurl virus in 1992-93, devastating the process tomato industry. A key component of management in both locations was the voluntary (Florida) or mandatory (DR) imposition of a crop-free period in summer to break the cycle of both virus and vector. In Florida, it was demonstrated that tomato was practically the only source of virus inoculum and that whitefly did not survive well on native weeds, due largely to natural biological control. However, early “plow-down” and prohibition of all vegetable production during summer was successful in the Dominican Republic, in spite of the presence of alternative weed hosts of TYLCV. This success demonstrated the predominant role of tomato as a source of TYLCV and of vegetables in general as whitefly sources. Widespread use of the insecticide imidacloprid in Florida greatly reduced whitefly populations to the extent that ToMoV has largely disappeared, although TYLCV is now posing a new threat. Imidacloprid was used much less in the lower input Dominican process tomato industry which relied more on protecting transplant production, planting schedules and host plant resistance. These experiences demonstrate the importance of a crop-free period for successful management of the whitefly/geminivirus complex.

THE EPIDEMIOLOGY AND MANAGEMENT OF TOMATO LEAF CURL VIRUS AND BEMISIA TABACI IN SOUTHERN INDIA

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Tomato leaf curl virus (ToLCV), transmitted by the whitefly Bemisia tabaci, is considered by tomato farmers in southern India to be their most important crop pathogen. ToLCV epidemics occur annually in the “summer months” (February-May) in this region and when infection occurs at an early stage of crop development, the disease can result in total yield loss.

ToLCV was detected in field-collected B. tabaci using a triple-antibody sandwich enzyme-linked immunosorbent assay (TAS-ELISA) as well as in weed species commonly found in Karnataka State. ToLCV from c. 61% of infected plants was transmitted successfully to tomato by B. tabaci. Weed species that are hosts of both the virus and the vector had averages of between 1.5-10.0 B. tabaci nymphs per plant, whereas the tomato plants had only 0.3 nymphs per plant. Additional data collected in the screen house and in the field showed that tomato is not a preferred host of south Indian B. tabaci, and that most of the ToLCV infection in the field arises from the movement of viruliferous B. tabaci adults into the crop. When tomato was grown for the first time in an entirely new area, ToLCV incidence reached c. 83% only 90 days after planting, demonstrating the importance of alternative host-plant species in this pathosystem.

The potential of several management technologies such as ToLCV-resistant tomato genotypes, nylon nets and mycoparasitoids were assessed in screening and field trials and a management approach based on an improved understanding of the B. tabaci/ToLCV/tomato system in southern India will be presented.